UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/596,000	01/17/2007	Hiroyuki Kanbara	36856.1455	1561

54066 7590 06/22/2010

MURATA MANUFACTURING COMPANY, LTD.
C/O KEATING & BENNETT, LLP
1800 Alexander Bell Drive
SUITE 200
Reston, VA 20191

EXAMINER	
EOFF, ANCA	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
06/22/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

JKEATING@KBIPLAW.COM
uspto@kbiplaw.com
cbennett@kbiplaw.com

Office Action Summary	Application No.	Applicant(s)	
	10/596,000	KANBARA ET AL.	
	Examiner	Art Unit	
	ANCA EOFF	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 March 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *20,22-29,31 and 33-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20,22-29,31 and 33-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 20, 22-29, 31 and 32-36 are pending in the application. Claims 1-19, 21, 30 and 32 are canceled.

2. The foreign priority document JP 2003-393551 filed on November 25, 2003 was received and acknowledged. However, in order to benefit of the earlier filing date, a certified English translation is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 20, 22, 23, 26, 29, 31, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (JP 05-204151) in view of Frechet et al. (US Patent 5,648,196).

With regard to claims 20 and 31, Ikeda et al teach a conductive paste comprising:

- metal powder, equivalent to the conductive powder of the instant application;

- a binder polymer;

- a polyfunctional radical polymerizable monomer, equivalent to the photosensitive monomer of the instant application and

- a radical generator (see claim 1), which is equivalent to the photopolymerization initiator of the instant application.

Ikeda et al. further teach that 20-500 parts by weight of the conductive powder may be mixed with 5 parts by weight of a photosensitive resin composition comprising 50 parts by weight of binder polymer, 10-300 parts by weight of the polymerizable monomer and 0.1-10 parts by weight of the radical generator (see claim 1).

A paste obtained by mixing 30 parts by weight of powder with 5 parts by weight of a photosensitive resin comprising 50 parts binder, 300 parts of polymerizable monomer and 10 parts radical generator is equivalent to a paste comprising:

- 85% conductive powder;

- 12% polymerizable monomer and

- 0.37% radical generator.

When the photosensitive resin comprises 50 parts binder and 300 parts of polymerizable monomer, the ratio polymerizable monomer / (polymerizable monomer + binder) is approximately 0.86, which meets the limitations of the instant application.

Ikeda et al. do not specifically teach the photosensitive paste of the instant application. However, it would have been obvious to use such a paste, based on Ikeda's teachings regarding the amounts of each component of the paste.

The amount of conductive powder and polymerizable monomer are within the ranges of the instant application.

The amount of radical generator/photopolymerization initiator of Ikeda et al. is not within the range of the instant application.

However, it is well-known in the art that by increasing the amount of photopolymerization initiator, the sensitivity of the photopolymerizable composition increases, as evidenced by Frechet et al. (column 12, lines 15-18 and fig.2). The amount of photopolymerization initiator in a photopolymerizable composition is a result-effective variable, having influence over the sensitivity of the composition and therefore it may be optimized.

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result- effective variable.). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy). (MPEP 2144.05-II.B).

It would have been obvious to one of ordinary skill in the art at the time of the invention to increase the amount of radical generator /photopolymerization initiator in the composition of Ikeda et al., in order to increase the sensitivity of the conductive paste.

Ikeda et al. further teach that the conductive paste is used for forming a thick film pattern (see the Purpose section of the Abstract). The conductive paste is used in a process comprising the steps of:

- applying the conductive paste on a substrate and drying (par.0037);
- exposing to radiation (par.0037), and
- developing (par.0038-0039).

With regard to claims 22 and 31, Ikeda et al. teach a polymerizable monomer having a double bond concentration within the range of about 8 mmol/g to about 11 mmol/g, such as trimethylolpropane triacrylate (par.0019).

With regard to claims 23 and 34, Ikeda et al. teach a monomer having an ethylene oxide structure with a degree of polymerization of 3 or less, such as ethylene oxide modified trimethylolpropane triacrylate (par.0019 and par.0021).

With regard to claim 26, Ikeda et al. teach that an organic solvent may be used as solvent (par.0040). In a specific example, Ikeda et al. show that 1,1,1-trichloroethane is used as developer (par.0046).

With regard to claim 29, Ikeda et al. further teach that the conductive paste is used for forming a thick film pattern (see the Purpose section of the Abstract). The conductive paste is used in a process comprising the steps of:

- applying the conductive paste on a substrate and drying (par.0037);
- exposing to radiation (par.0037), and
- developing (par.0038-0039).

After development, the pattern formed by the paste may be heated to 400^{o}C for 60 minutes (par.0046), equivalent to the firing of the instant application.

5. Claims 24 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (JP 05-204151) in view of Frechet et al. (US Patent 5,648,196) as applied to claims 20 and 31 above and in further view of Kubota et al. (US Pg-Pub 2003/0036020).

With regard to claims 24 and 35, Ikeda modified by Frechet teach the method of claim 20 and the conductive paste of claim 31 (see paragraph 4 above) but fail to teach an UV absorber in the conductive paste.

Kubota et al. teach a photosensitive conductive paste comprising a powdered metal, an organic binder, a photosensitive organic component such as a photopolymerization initiator (abstract and par.0032).

Kubota et al. further teach that it is preferable to add an UV absorber to the photosensitive conductive paste in order to reduce exposure defects caused by light scattering (par.0034).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Kubota et al. and add an UV absorber to the conductive paste of Ikeda modified by Frechet, in order to reduce exposure defects caused by light scattering.

6. Claims 25 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (JP 05-204151) in view of Frechet et al. (US Patent 5,648,196) as applied to claims 20 and 31 above and in further view of Crary (US Patent 3,661,576).

With regard to claims 25 and 36, Ikeda modified by Frechet teach the method of claim 20 and the conductive paste of claim 31 (see paragraph 4 above) and Ikeda et al. show an example wherein the paste comprises approximately 7% by weight of solvent (see par.0046).

This amount of not within the range of claims 25 and 36 of the instant application.

However, it is well-known in the art that the amount of solvent added to a photopolymerizable composition can be varied widely in accordance to the viscosity desired for the particular coating method by which the compositions are applied to substrates and films , as taught by Crary (column 12, lines 6-10).

The amount of solvent in a composition is a result-effective variable, having influence over the viscosity of the composition and therefore it may be optimized. (MPEP 2144.05.II.B).

It would have been obvious to one of ordinary skill in the art at the time of the invention to vary the amount of solvent in the conductive paste of Ikeda modified by Frechet, in order to optimize the viscosity of the paste for coating.

7. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (JP 05-204151) in view of Frechet et al. (US Patent 5,648,196) as applied to claim 20 above and in further view of Broers et al. (US Patent 4,557,995)

With regard to claim 27, Ikeda modified by Frechet teach the method of claim 20 (see paragraph 4 above).Ikeda et al. further teach that the conductive paste may be imaged with a photomask (par.0046).

However, Ikeda and Frechet fail to teach that the photosensitive paste and the photomask are arranged to be kept from contacting with each other in the exposure step

It is known in the art, as evidenced by Broers et al. in fig. 3 and column 4, lines 57-62 that the exposure may be done with the mask not contacting the resist layer.

Therefore, it would have been obvious to one of ordinary skill in the art to perform the exposure with a photomask which is not contacting the resist layer, such exposure process being conventional in the art.

Therefore, the limitation of "the photosensitive paste and the photomask are arranged to be kept from contacting with each other in the exposure step" is met.

8. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. (JP 05-204151) in view of Frechet et al. (US Patent 5,648,196) as applied to claim 20 above and in further view of Iguchi et al. (US Patent 6,197,480).

With regard to claim 28, Ikeda modified by Frechet teach the method of claim 20 (see paragraph 4 above).

Ikeda et al. further teach that the paste may be imaged with ultraviolet radiation through a mask (par.0037 and par.0046) but fail to disclose that the exposure may be performed without using a photomask.

Iguchi et al. disclose a photosensitive paste including inorganic particles and organic components (abstract). Iguchi et al. further teach a process comprising the following steps:

- applying the paste to a film (column 12, line 37);

- exposing the paste, preferably with UV light (column 12, lines 45-62);

Iguchi et al. disclose direct pattern formation by means of a red or blue visible laser beam or Ar ion laser beam may be performed instead of using the mask (column 12, lines 51-53).

- developing the making use of the difference in solubility to developing solution between the exposed and the unexposed portions (column 13, lines 25-27);

- firing the pattern (column 13, line 55).

Due to the fact that the patterning process of Ikeda modified by Frechet and Iguchi are directed to photosensitive pastes, it would have been obvious to one of ordinary skill in the art at the time of the invention to perform the exposure step of the process of Ikeda modified by Frechet by direct pattern formation as disclosed by Iguchi et al.

The direct pattern formation step of Ikeda modified by Frechet and Iguchi is equivalent to the step of exposure without a mask of the instant application.

Response to Arguments

9. Applicant's arguments filed on March 18, 2010 have been fully considered but they are not persuasive.

On pages 2-4 of the Remarks, the applicant argues that Ikeda et al. do not teach the photosensitive paste of the instant application. On pages 2-3 of the Remarks, the applicant cites par.0029 of Ikeda et al. which shows that the binder polymer should be in amount of 50 parts by weight and the polyfunctional

monomer could be in an amount between 10 and 300 parts by weight. If the amount of monomer is over 300 parts by weight, it is difficult to maintain a good viscosity of the paste composition.

The applicant concludes that the maximum value of the radical polymerizable monomer / (radical polymerizable monomer + binder) is 0.857 for the paste of Ikeda et al.

The examiner showed in paragraph 4 of the pervious Office Action that a paste comprising 50 parts by weight of binder and 300 parts by weight of monomer has a *ratio of the polymerizable monomer / (polymerizable monomer + binder) of approximately 0.86.*

The examiner maintains the position that a ratio of 0.857 is approximately 0.86.The ratio of the polymerizable monomer / (polymerizable monomer + binder) of 0.86 meets the limitation of claims 20 and 31 of the instant application.

On page 3 of the Remarks, the applicant argues that in Ikeda et al. the polymerizable monomer cannot exceed 300 parts by weight so the ration of the polymerizable monomer / (polymerizable monomer + binder) cannot exceed 0.857. The applicant further argues that Ikeda et al. teach away from the feature of a ratio polymerizable monomer / (polymerizable monomer + binder) equal to or greater than 0.86.

The examiner agrees that Ikeda et al. teach away from an amount of polymerizable monomer of more than 300 parts by weight (par.0029). This is equivalent to Ikeda et al. teaching away from a ratio polymerizable monomer /(polymerizable monomer + binder) *greater than 0.86*.

However, Ikeda et al. clearly shows that the polymerizable monomer might be in amount of 300 parts by weight (see abstract, par.0029), which is equivalent to a ratio polymerizable monomer /(polymerizable monomer + binder) *equal to 0.857, which is rounded up to 0.86.* This value meets the limitation of claims 20 and 31.

The examiner would like to point out that the examples of the instant application also use the same rounding up to the nearest hundredth (see Comparative Example 4 on page 62 wherein 0.529 is rounded up to 0.53 and Comparative Example 5 on page 64 wherein 0.405 is rounded up to 0.41).

On pages 4-5 of the Remarks, the applicant argues that it would not have been obvious to modify the amount of photopolymerization initiator of Ikeda et al., based on the teachings of Frechet. The applicant further argues that Frechet et al. teach photoacid generators as photoactive agents for cationic polymerization while Ikeda et al. teach a radical polymerization.

The applicant further argues that the cationic polymerization of Frechet et al. and the radical polymerization of Ikeda et al. are different processes and cites a website for further information.

The examiner would like to show that Ikeda et al. teach photopolymerizable compositions comprising radical polymerizable monomer, a binder and a photoradical generator (abstract). The photoradical generator is the compound giving the composition its photosensitivity (par.0009 of Ikeda et al.).

It is also known in the art that a radical generator functions as photoinitiator (see Kyle (US Patent 5,234,970), column 6, lines 40-42).

Therefore, the photoradiacl generator of Ikeda functions as photoinitiator.

Frechet et al. teach photoinitiators (see abstract) and further show that by increasing the amount of photoinitiators, the sensitivity of the composition is increased (see column 11, lines 32-33).

The teachings regarding the amount of photoinitiators of Frechet et al. clearly show that the amount of photoinitiator is a result-effective variable and may be optimized.

Therefore, it would have been obvious to one of ordinary skill in the art to increase the amount of radical generators/photoinitiators of Ikeda et al. in order to increase the sensitivity of the photosensitive paste.

The examiner would like to note that on page 4 of the Remarks, the applicant cites column 2, lines 44-54 of Frechet et al. to point out that the photoacid generators of Frechet are used for cation polymerization. There is no teaching regarding “cation polymerization” in this paragraph, which is cited below:

> As used herein, the term "photoinitiator" refers to a compound which initiates a reaction upon exposure to radiation. Photoinitiators include a wide range of compounds, including "photoactive agents," which are compounds whose chemical composition is altered upon exposure to radiation. One preferred class of photoactive agents includes "photoacid generators", which are compounds which produce acid upon exposure to radiation. Photoinitiators, photoactive agents, and photoacid generators are useful in both the formation of positive-tone and negative-tone photoresists.

Furthermore, there is no mention of cationic/cation polymerization in Frechet.

Frechet et al. teach sulfonium salts (see abstract) and the sulfonium salts are well-known to be used as radical polymerization initiators (see Hoshi et al. (US Pg-Pub 2002/0177074), par.0038).

Therefore, one of ordinary skill in the art would have been motivated to apply the teachings regarding the amount of photoinitiators of Frechet et al. for the radical generators functioning as photoinitiators of Ikeda et al.

Conclusion

10. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANCA EOFF whose telephone number is (571)272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. E./
Examiner, Art Unit 1795

/Cynthia H Kelly/

Supervisory Patent Examiner, Art Unit 1795